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ABSTRACT

Approximately 2,500 undergraduate students at The University of Texas enroll each year in a course entitled "Introduction to Business Data Processing." Over one-third of these students are taught in large classes (between 180 and 300 students) via multimedia presentation. Every lecture is prepared as a four-screen slide show with the frequent use of supplemental aids, such as CRT's with video projection, 16mm film, and closed circuit television. A description of the course is given, along with an analysis of its successes and failures. (Author/CMV)

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MULTIMEDIA APPROACH TO BUSINESS DATA PROCESSING INSTRUCTION

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Multimedia Approach to Business Data Processing Instruction

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Abstract

Approximately 2,500 undergraduate students at The University of Texas enroll each year in a course entitled "Introduction to Business Data Processing." Over one-third of these students are currently being taught in large (between 180 and 300 students) classes via a multimedia presentation. Every lecture is prepared as a four-screen slide show with the frequent use of supplemental aids, such as CRT's with video projection, 16mm film, and closed circuit television. The main intent of this paper is to describe an innovative approach to classroom instruction, along with the successes and failures of the system.

Introduction

Since 1966 a three-hour course in business data processing has been required of all students on route to a BBA degree at The University of Texas at Austin. Approximately 2,500 undergraduate students enroll in this course each year. Until 1974 more than 80 percent of this number were taught by teaching assistants (TA's/student teachers) in classes averaging forty-five students. This high percentage of direct TA contribution created two major problems: (1) the accreditation rating of the College of Business Administration was low, and (2) the overall consistency of course content and quality was difficult to maintain. To alleviate these difficulties the college introduced large multimedia classes taught by full-time faculty members. In the fall 1976 semester, of the 1,132 undergraduate students enrolled in the introductory data processing course, 480 were taught in two multimedia sections and the remainder were taught in classes of approximately forty-five students each. Two of the smaller classes were also taught by full-time faculty. Thus, only about 50 percent of the students were taught by TAs.

Of course, large classes are of no true benefit unless the quality of education can be maintained and student prejudice against mass instruction can be overcome. To achieve this, over 1,200 man hours were spent developing multimedia presentations for the data processing course. We feel that this has resulted in an innovative approach to classroom instruction. Every lecture is given as a four-screen slide show with the frequent use of supplemental aids, such as CRT's with video projection, 16mm film and closed circuit television. The students can, while in the classroom, see: (1) a problem statement, (2) a step-by-step development of the flowchart to solve the problem, (3) the conversion of the flowchart to a computer language (in our case, BASIC), and (4) a computer execute the program with sample data.

Slides picturing computer hardware and data processing systems, in addition to title slides for concepts and definitions, assist the student in conceptualizing aspects of business data processing. Since the slides present the material in a clear, well organized, logical sequence, note-taking is enhanced. By having the complete lecture developed on slides, the instructor is not required to spend class time writing on the blackboard, and can maintain eye contact. Also, the large classes free TA's from platform teaching requirements so that they can conduct group-help sessions and give individual assistance at remote computer sites.

The next section will outline briefly the content of the introductory business data processing course. Section Three will describe the use of the multimedia facilities in the

classroom presentations. The successes and failures of these teaching techniques will be discussed in Section Four.

Course Content

The primary objective of the course is to provide students with a fundamental knowledge of the interactions of computer hardware, software, and personnel in a business environment. In most respects the subject matter covered is similar to that found in other introductory data processing courses. Because it is felt that the student can neither appreciate nor understand the concepts of data processing without some programming knowledge, approximately one-half of the course is spent on flowcharting and learning the programming language BASIC.[3] BASIC was chosen because it is easy to learn and well suited to interactive terminal usage. Sample problems involving payrolls, inventory, interest calculations, and other business related topics are flowcharted and coded in BASIC. During the semester every student is required to flowchart, code in BASIC, and solve on the computer more than ten homework problems. Both batch processing and interactive facilities are utilized to do the assignments.

Three computer systems, remote batch facilities, and interactive terminals are available for student use. The main Computation Center maintains a Control Data Corporation (CDC) 6400/6600 linked in a dual environment as well as a Digital Equipment Corporation (DEC) DEC-10 system. The College of Business Administration has a stand-alone computer system as well as a remote batch station and interactive terminals for usage of the Computation Center facilities. The stand-alone system is a CDC 3100 used by introductory students for canned programs only. The remote batch station is a PDP 11/40 with low speed card reader and medium speed line printer for communication with the CDC 6400/6600. For interactive processing the college has a computer terminal laboratory with fifteen CRT terminals and twenty ASR Model 33 teletypes. Several terminals are hard-wired to the CDC 6400/6600, several are hard-wired to the DEC-10, and the remainder are on dial-up lines.

Computer hardware components which are described in the course include the Central Processing Unit (CPU) and its subunits, and devices for data preparation, input/output, and secondary storage. Only a very cursory description is given to the physical aspects of these components. The main emphasis is placed on the functional aspects. It is the intent of the course to stress what the devices do, when certain hardware should be used, and the relation to computer software.

Emphasis is placed on how the computer software utilizes the CPU. It is felt that it is particularly important, when discussing internal storage, to delineate the difference between an actual address, a symbolic address, and the contents of an address. These concepts are then carried over to the lectures on computer software. It is pointed out that the variable name is a symbolic address, the computer executes with the actual address, and the value of the variable is the contents of the address. This has proven to be most helpful when introducing the student to flowcharting and BASIC.

The textbook for the course is *Introduction to Contemporary Business Data Processing.*[2] This book was written at The University of Texas and is explicitly designed to describe the computer systems on the campus. It also contains all the material on hardware and software necessary for the course.

Multimedia Presentation

Essentially the same material is covered in the regular-size classes with about 45 students per class, and in the 2 large classes with 180 and 300 students, respectively. However, the mode of presentation is entirely different. It should be recognized that a completely oral presentation would be very inappropriate for this type of class. Also, the use of the blackboard as a visual aid on a regular basis in the large classes is unrealistic for two reasons. First, unless the characters are written in extremely large print, students in the

rear of the room can not read them, and second, a very limited amount of blackboard space is available in the assigned classrooms. Thus, the instructors in the large classes are forced to give some type of screen presentation. Because a four-screen slide show allows a great deal of flexibility and because the facilities for such a show are available at The University of Texas, this was chosen as the primary visual aid in the two large sections of an "Introduction to Business Data Processing." Rear screen projection is utilized in these facilities, permitting the projection of slides without the annoyance of light beams. The instructor is then free to walk about and point out items on the screens without a spotlight effect or casting a shadow.

Other visual aids which are utilized in the classroom are a 16mm film projector, overhead projector, television/video-cassette player, and a video-beam projector coupled to a CRT. The latter device allows the capability for realtime computer output to be displayed in the classroom.

Over 1,200 hours have been spent developing slides and scripts for the multimedia presentations. Thirty-five one-hour lectures requiring a total of 2,500 slides have been prepared. The majority of these slides are colored, and when several related topics are presented on a single screen, the topic being discussed is highlighted through the use of colors. Although the presentations over the past three semesters have been fairly stable, revisions and additions to the material are being made as technology changes or improved methods of exposition are recognized.

A frequently used technique in the multimedia presentations is to disperse the subject matter across the 7-foot by 7-foot screens. For example, when lecturing on the fundamentals of data organization (data hierarchy) the screen displays are organized as follows. Screen one contains words "Data Hierarchy" throughout the discussion. Screen two progressively discloses the different levels of data hierarchy; that is, (1) characters, (2) items, (3) records, (4) files, and (5) data bases. As a different level appears, the definition is displayed on screen three and then a series of examples are given on screen four. Thus, the student is able to see at one time the main topic, the relationship between data hierarchy levels, the definition of that data hierarchy level being discussed, and examples. The presentation techniques of progressive disclosure, item highlighting, and subject dispersion are effective pedagogical devices and are used often.

Another frequently used technique is to sequentially develop a flowchart and/or BASIC program on the screens. Handouts which give both the problem statement and complete flowchart/program are distributed at the end of class. This alleviates the majority of the note-taking burden and allows the students to participate actively in the problem solving process. When flowcharting or programming a problem, the problem statement remains on screen one for the students to reference during the lecture. After the problem statement is discussed, a system level flowchart or a solution technique is sequentially developed on screen two; that is, a series of slides, each appending an additional symbol to the flowchart, are presented and discussed. Next, variable names are defined on screen four. A program (detail) level flowchart is then progressively developed on screen three. If a BASIC program is desired, this can be done on screen two. The program may either be progressively developed with slides or it may be entered in an interactive mode via a CRT terminal. Through the use of a video-beam projector, the students can see everything displayed on the CRT screen. The program can then be run using sample data previously stored on magnetic disk. Thus, the students are able to see actual instructor-computer interaction while in the classroom.

The video-beam projector is also used to demonstrate the use of specific BASIC statements. Small BASIC programs, designed to illustrate the syntax and semantics of certain BASIC statements, are executed in class via interactive processing. This allows the instructor to display results which would be very difficult, if not impossible, to relate orally. Also, questions on rather obscure workings of the BASIC language can be

answered in class by executing BASIC programs. Rather than guess what the BASIC compiler will do, the desired procedure can be executed and the results displayed. An additional benefit derived from utilizing a CRT in the classroom is student exposure to the computer system commands, BASIC editing features, and file manipulation procedures.

Other supporting devices utilized in the lectures include TV video-cassette player and 16mm film projector. The majority of the films and cassettes are supplied by computer vendors. They are used to augment the lectures and, in some cases, bring a little levity into the classroom. Examples of the former function include an IBM 16mm film entitled "Printing with Light" which is used in conjunction with the lecture on computer output devices, and a TV cassette (locally produced) on how to submit batch jobs at The University of Texas Business School. An example of the lighter side is an IBM film entitled "Coffee Break," which features the Muppets in humorous skits involving computers. A film distributed by McGraw-Hill entitled "Introduction to Flowcharting" actually combines humor with important flowcharting concepts. In this film a mechanical man is programmed to walk through a maze. A step-by-step flowchart of the man's movements is developed. Thus, with the aid of a little slapstick, students are introduced to a logical thought process involving repetitive operations (looping).

Successes and Failures

The most apparent success of the multimedia presentations is the capability to teach more students effectively in a single section. This allows a much higher percentage of the total course enrollment to be taught by full-time faculty. Although many of the TA's are outstanding teachers, in general both the quality of the course and the consistency of the material covered has been improved as a result of the large multimedia classes. Because fewer TA's are now required for platform teaching duties, more individual assistance can be given to students outside of the classroom. TA's on three-quarter time (ten hours a week) are assigned to assist the faculty in providing outside-of-the-classroom help to students enrolled in the two large sections. TA's on seven-quarter time are assigned to monitor the activities of the business school's terminal laboratory. The latter group of TA's is available to all the students enrolled in "Introduction to Business Data Processing." While they are open to any questions concerning the course, the primary responsibilities of these TA's are to instruct students in the use of the available computer hardware and to assist in debugging BASIC programs.

The students have responded very favorably to the multimedia presentations. Both large sections always achieve maximum enrollment and the drop rate among the students in these two sections is considerably less than that of the smaller sections. Also, the University-wide course evaluations given at the end of each semester reflect student approval. Most students indicate that a multimedia presentation is a great improvement over a traditional blackboard presentation. They frequently give verbal compliments about the slide shows and "live" computer demonstrations. The students feel that the use of the CRT with video projection is a valuable aid for overcoming the "computer mystique."

The successes of the multimedia classes are documented in other areas. The majority of the students who elect to take the more advanced business data processing courses are those previously taught in the large sections of the required introductory course. Reports from instructors of other business school courses which utilize the material from the "Introduction to Business Data Processing" course verify that students from the large sections are more than competitive with students from the smaller sections. Certainly, the average student seems to benefit from the multimedia presentation.

The failures of the multimedia sections are similar to those found in all large sections. Some students do feel inhibited when placed in such a large group; thus, questions are not asked as spontaneously as in a smaller group.

However, the students who would ask questions regardless of the environment create a healthy amount of student-instructor interaction. It is, nevertheless, very difficult for the instructor to gain any degree of familiarity with the individual student. In our opinion this causes some of the students to feel alienation and, as a result, become apathetic about the course.

Finally, we would like to point out aspects of the multimedia presentations which indicate neither a success nor a failure but are merely a byproduct. A great deal more time is required to prepare a multimedia lecture. A script must be written and approximately 100 slides loaded for each one-hour lecture. The complete presentation must be carefully planned before class. Minor changes in the script from semester to semester require hours of work. Administering and grading examinations are also an order of magnitude greater in the large sections than in the smaller sections. Special rooms must be scheduled to accommodate the classes. Frequently students are asked to write flowcharts or BASIC programs on a test and it is a very time consuming task evaluating 300 responses to this type of question.

Conclusions

The successes of the multimedia sections far outweigh their failures. A large number of students are taught by a single full-time faculty member while maintaining the quality of education. All the notes for the course are displayed on four 7-foot by 7-foot screens. In addition to the four slide projectors, a 16mm film projector, a TV videocassette player, and a CRT coupled to a video-beam projector are utilized. The students are able to see the subject matter clearly and sequentially developed in color with a variety of presentation strategies used for emphasis, retention, and interest. The material is reinforced and augmented with films, and a clearer understanding of programming is possible through the use of the computer in the classroom.

To the best of our knowledge, the "Introduction to Business Data Processing" course at The University of Texas utilizes multimedia presentations to a far greater extent than any other course of its type in the country. There would appear to be two main reasons for this. First, a great deal of time and money must be expended to develop the scripts and slides. Second, the equipment for producing and delivering multiple-screen, multimedia shows is not available at most institutions. Even at schools where this equipment is available, the multimedia facilities are generally *not* used in conjunction with computer related courses. We feel that the presentations discussed in this paper are rather unique.

The College of Business at The University of Texas is fortunate in having excellent media production and presentation facilities.[1] At universities where it is desirable to teach large sections in a computer related course, presentations similar to those discussed in this paper may be very beneficial and worth the investment. However, many of the teaching aids presented here are applicable to smaller classes as well. In particular, a CRT terminal with video projection is used for classroom demonstrations by many instructors in the College of Business. Also, many of the advantages of multimedia-augmented lectures can be realized through the use of single-screen, front projection. The equipment needed for small classroom applications should be well within the budget of most institutions.

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